

CLAIMS:

1. A method of acquiring a three-dimensional image data set of a periodically moving organ (11) of the body of a patient (5) by means of an X-ray device (1) which includes an X-ray source (2) and an X-ray detector (3), a motion signal (H, B) which is related to the periodic motion of the body organ (11) being acquired simultaneously with the acquisition of projection data sets (D_0, D_1, \dots, D_{16}), characterized in that the projection data sets (D_0, D_1, \dots, D_{16}) required for the formation of the three-dimensional image data set are successively acquired from different X-ray positions (p_0, p_1, \dots, p_{16}) which are situated in one plane, that the X-ray device is controlled by means of the motion signal (H, B) in such a manner that a projection data set (D_0, D_1, \dots, D_{16}) is acquired during a low-motion phase of the body organ (11) in each X-ray position (p_0, p_1, \dots, p_{16}) required for the formation of the three-dimensional image data set, and that the projection data sets (D_0, D_1, \dots, D_{16}) acquired during the low-motion phases are used for the formation of the three-dimensional image data set.

10 2. A method as claimed in claim 1, characterized in that only the projection data sets (D_0, D_1, \dots, D_{16}) that have been acquired during the same motion phases (H₁, B₁) are selected and used.

15 3. A method as claimed in claim 1, characterized in that the various X-ray positions (p_0, p_1, \dots, p_{16}) are successively occupied in an X-ray cycle (R₁), that a plurality of X-ray cycles (R₁, R₂) are successively completed, and that the X-ray device (1) is controlled by means of the motion signal (H, B) in such a manner that each X-ray cycle (R₁, R₂) commences in a different phase of motion (H₁, H₂; B₁, B₂, B₃) of the body organ (11).

20 4. A method as claimed in claim 1, characterized in that the X-ray device (1) is controlled by means of the motion signal (H, B) in such a manner that projection data sets (D_0, D_1, \dots, D_{16}) are acquired only during low-motion phases (H₁; B₁, B₃) of the body organ (11).

5. A method as claimed in claim 1, characterized in that the X-ray device (1) is controlled by means of the motion signal (H, B) in such a manner that the X-ray source (2) is switched on so as to acquire projection data sets (D_0, D_1, \dots, D_{16}) exclusively during low-motion phases ($H_1; B_1, B_3$) of the body organ (11).

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6. A method as claimed in claim 1, characterized in that a respiratory motion signal (B) which is dependent on the patient's respiration is acquired as a motion signal.

7. A method as claimed in claim 1, characterized in that a cardiac motion signal (H), notably an electrocardiogram, which is dependent on the motion of the heart is acquired as the motion signal.

8. A method as claimed in claim 7, characterized in that in addition to the cardiac motion signal (H) there is acquired a respiratory motion signal (B) which is dependent on the respiratory motion, and that the respiratory motion signal (B) is used to ensure that only the projection data sets (D_0, D_1, \dots, D_{16}) that have been acquired during the same respiratory motion phases (B_1) are used to form the three-dimensional image data set.

9. A method as claimed in claim 8, characterized in that the respiratory motion signal (B) is used to correct, during the formation of the three-dimensional image data set, the projection data sets (D_0, D_1, \dots, D_{16}) that have been acquired in different respiratory motion phases (B_1, B_2, B_3) and the shifts in position of the body organ (11) resulting therefrom.

10. A method as claimed in claim 6, 8 or 9, characterized in that the respiratory motion signal (B) is used to inform the patient (5) that a desired respiratory motion phase (B_1) has been reached during which the acquisition of the projection data sets (D_0, D_1, \dots, D_{16}) takes place.

11. A method as claimed in claim 1, characterized in that the motion signal (H, B) is used to control the X-ray device (1) in such a manner that projection data sets (D_0, D_1, \dots, D_{16}) are acquired from individual, selected X-ray positions (p_0, p_1, \dots, p_{16}).

12. An X-ray device, notably for carrying out the method claimed in claim 1, which includes an X-ray source (2) and an X-ray detector (3) for the acquisition of a plurality

of projection data sets (D_0, D_1, \dots, D_{16}) from different X-ray positions (p_0, p_1, \dots, p_{16}) and for the formation of a three-dimensional image data set of a periodically moving organ (11) of the body of a patient (5) from the projection data sets (D_0, D_1, \dots, D_{16}), and also includes means (7, 8, 9, 10) for measuring a motion signal (H, B) which is related to the periodic

5 motion of the body organ (11) and is acquired simultaneously with the acquisition of the projection data sets (D_0, D_1, \dots, D_{16}), characterized in that there is provided an arithmetic and control unit (6) for controlling the X-ray device (1) and for forming the three-dimensional image data set in such a manner that the projection data sets (D_0, D_1, \dots, D_{16}) required for the formation of the three-dimensional image data set are successively acquired from different X-
10 ray positions (p_0, p_1, \dots, p_{16}) which are situated in one plane, that a projection data set (D_0, D_1, \dots, D_{16}) is acquired during a low-motion phase of the body organ (11) in each X-ray position (p_0, p_1, \dots, p_{16}) required for the formation of the three-dimensional image data set, and that exclusively the projection data sets (D_0, D_1, \dots, D_{16}) acquired during the low-motion phases are used for the formation of the three-dimensional image data set.

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13. An X-ray device as claimed in claim 12, characterized in that the means (7, 8) for measuring the motion signal are arranged to measure a cardiac motion signal (H) which is dependent on the cardiac motion.

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14. An X-ray device as claimed in claim 12, characterized in that the means (7, 8) for measuring the cardiac motion signal (H) include an electrocardiography device or a pulse oxymetry device.

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15. An X-ray device as claimed in claim 12, characterized in that the means (9, 10) for measuring the motion signal are arranged to measure a respiratory motion signal (B) which is dependent on the respiratory motion.

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16. An X-ray device as claimed in claim 15, characterized in that there is provided a signaling device (12) for informing the patient that a desired respiratory motion phase (B_1) has been reached.

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An X-ray device as claimed in claim 15, characterized in that the means (9, 10) for measuring the respiratory motion signal (B) include an ultrasound device, an

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abdominal belt for measuring the motion of the diaphragm, or a resistance measuring device
for measuring the resistance of the abdominal region of the patient (5).

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